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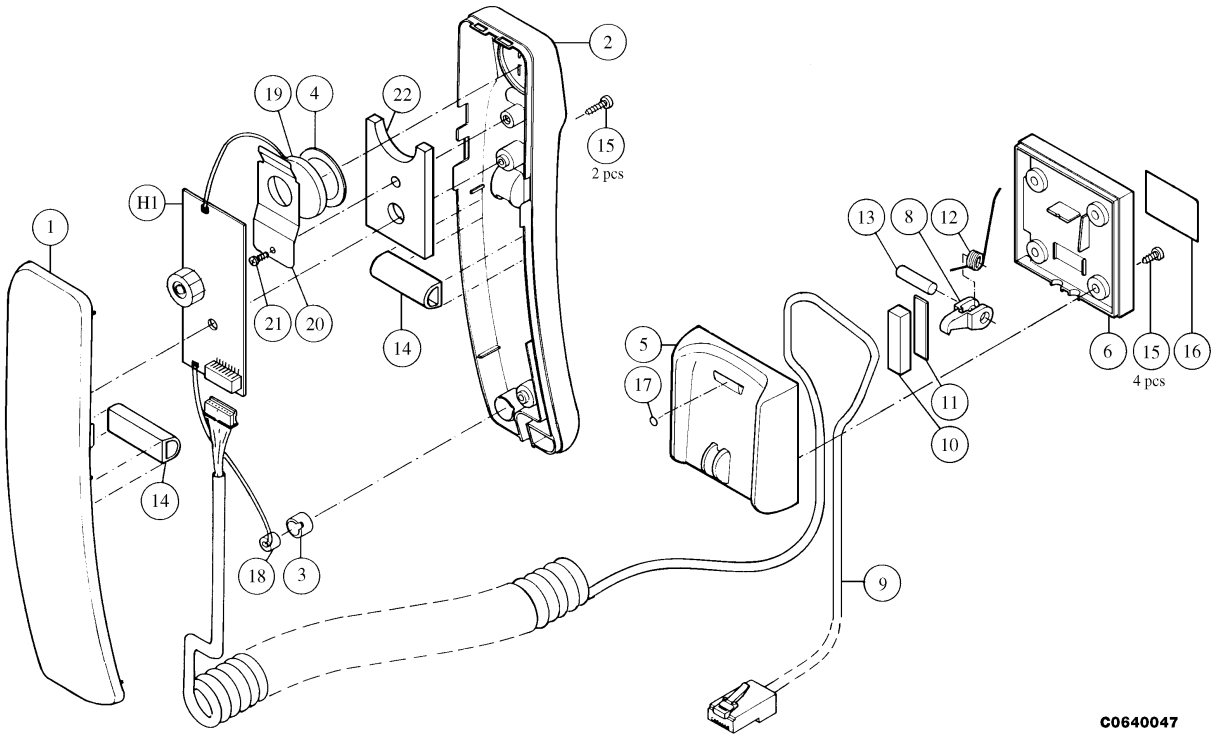
18	5140379	Cond. microphone 62 ±3 dB	2.2 kΩ 6x5
19	5140578	Receiver capsule 103 ±2 dB	
20	9510193	Earpiece clip	4D 24147
21	6291917	PT screw	KB25x5 FeZn clr
H1	0200221	Handset module DG–1	

Exploded view



Assembly parts

ITEM	Q'TY	CODE	DESCRIPTION	VALUE, TYPE
1		9450302	Front cover	2D 23151 HSU–1
2		9459393	Bottom cover	2D 23152 HSU–1
3		9450132	Mic spacer	4D 21588 NHE–2
4		9450133	Earphone spacer	4D 21596 NHE–2
5		9450304	Cradle cover	2D 23153 HSU–1
6		9450305	Cradle bottom	2D 23154 HSU–1
8		9460098	Latch	3D 23155 HSU–1
9		9780086	Coil cord	4C 22857 HSU–1
10		6490220	Magnet	4D 21413 CRE–1
11		7313054	Magnet pad	4D 21422 CRE–1
12		9560015	Spring	4D 23498 HSU–1
13		9560001	Spindle	4D 21412 CRE–1
14	2	9480171	D shape sealing	4D 24417
15	6	6154430	PT screw	KB25x8 FeZn clr
16		9380154	Label blank	4D 22419 23.8x17.5
16		9380154	Label HSU–1	4D 23481
16		9380154	Label HSU–1A	4D 24526
16		9380154	Label HSU–1P	4D 24591
17		9450075	Rubber pad	4D 21562

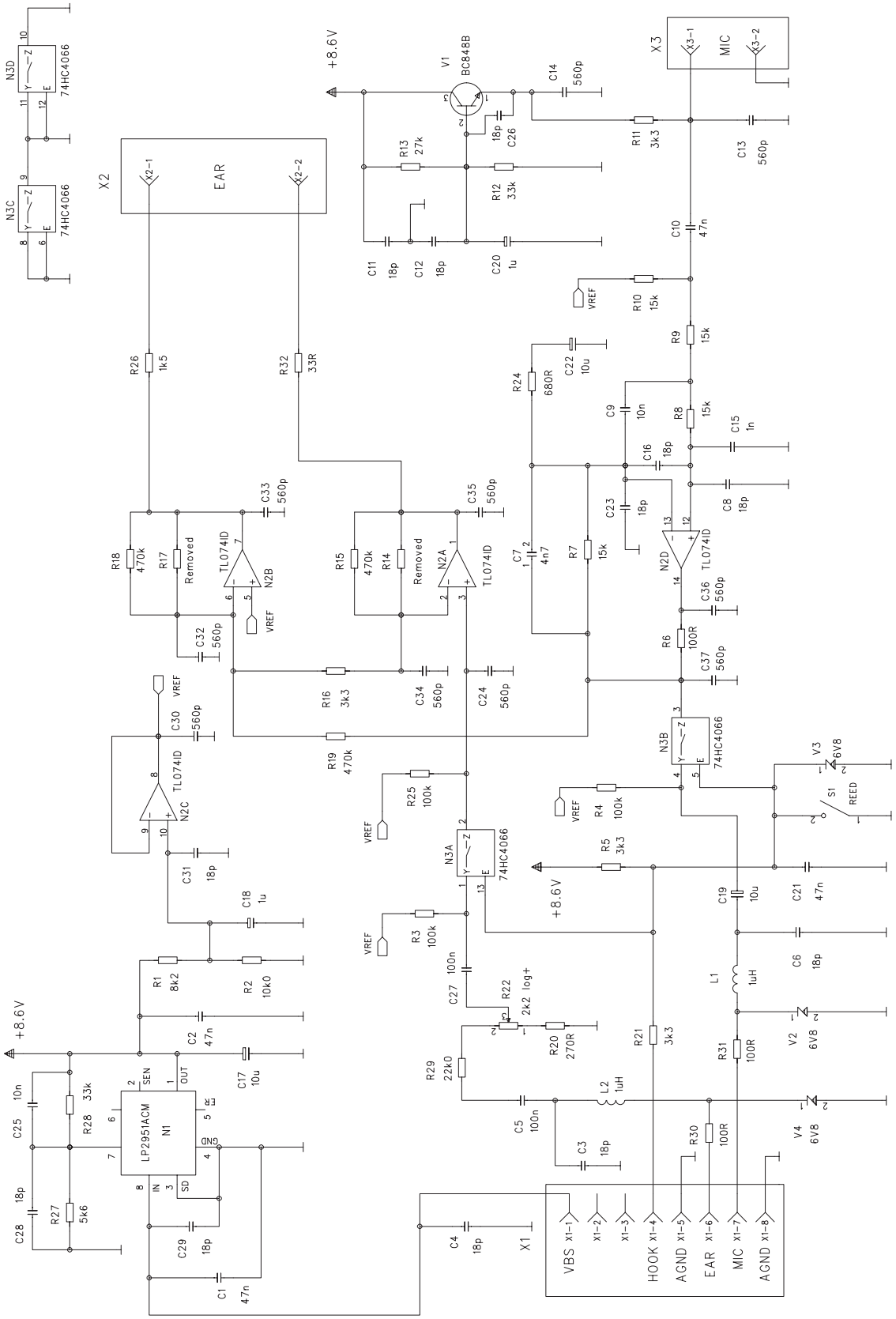
C015	2310544	Ceramic cap.	1.0 n	5 % 50 V 0805
C016	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C017	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C018	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C019	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C020	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C021	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C022	2604431	Tantalum cap.	10 u	20 % 16 V 6.0x3.2x2.5
C023	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C024	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C025	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C026	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C027	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C028	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C029	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C030	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C031	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C032	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C033	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C034	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C035	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C036	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C037	2310512	Ceramic cap.	560 p	5 % 50 V 0805
L001	3608502	Chip coil		5 % Q=28/35 MHz 1206
L002	3608502	Chip coil		5 % Q=28/35 MHz 1206
V001	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA SOT23
V002	4110140	Zener diode	BZX84	5 % 6.8 V 0.3 W SOT23
V003	4110140	Zener diode	BZX84	5 % 6.8 V 0.3 W SOT23
V004	4110140	Zener diode	BZX84	5 % 6.8 V 0.3 W SOT23
N001	4301062	IC, regulator	LP2951AC	SO8S
N002	4306494	IC, 2 x op.amp.	TL074ID	SO14
N003	4309488	IC, 4 x bi.switch	74HC4066	SO14S
S001	5304759	Reed relay 10at 0.5a 2x15 smd		
X001	5416638	Connector 8–pole right angle 1.5		1.5
X002	5416640	Pin header m1x2 p1.5 90deg 1a0r02		1A0R02
	9854017	PCB DG1 30.0X72.0X1.0 M2 6/PA		
	9854017	PC board	DG1	30.0x72.0x1.0 m2 6/pa

Parts List of DG1 (Version 1.1) Code 0200221

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R001	1414036	Chip resistor	8.2 k	5 % 0.1 W 0805
R002	1412430	Chip resistor	10 k	5 % 0.1 W 0805
R003	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R004	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R005	1414029	Chip resistor	3.3 k	5 % 0.1 W 0805
R006	1412261	Chip resistor	100	5 % 0.1 W 0805
R007	1414109	Chip resistor	15 k	5 % 0.1 W 0805
R008	1414109	Chip resistor	15 k	5 % 0.1 W 0805
R009	1414109	Chip resistor	15 k	5 % 0.1 W 0805
R010	1414109	Chip resistor	15 k	5 % 0.1 W 0805
R011	1414029	Chip resistor	3.3 k	5 % 0.1 W 0805
R012	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R013	1412609	Chip resistor	27 k	5 % 0.1 W 0805
R015	1413723	Chip resistor	470 k	5 % 0.1 W 0805
R016	1414029	Chip resistor	3.3 k	5 % 0.1 W 0805
R018	1413723	Chip resistor	470 k	5 % 0.1 W 0805
R019	1413723	Chip resistor	470 k	5 % 0.1 W 0805
R020	1412254	Chip resistor	270	5 % 0.1 W 0805
R021	1414029	Chip resistor	3.3 k	5 % 0.1 W 0805
R022	1703319	Tpmet 0w5 2k2 m		
R024	1414004	Chip resistor	680	5 % 0.1 W 0805
R025	1413635	Chip resistor	100 k	5 % 0.1 W 0805
R026	1412409	Chip resistor	1.5 k	5 % 0.1 W 0805
R027	1414406	Chip resistor	5.6 k	5 % 0.1 W 0805
R028	1412729	Chip resistor	33 k	5 % 0.1 W 0805
R029	1412536	Chip resistor	22 k	5 % 0.1 W 0805
R030	1412261	Chip resistor	100	5 % 0.1 W 0805
R031	1412261	Chip resistor	100	5 % 0.1 W 0805
R032	1412173	Chip resistor	33	5 % 0.1 W 0805
C001	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C002	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C003	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C004	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C005	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C006	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C007	2310738	Ceramic cap.	4.7 n	20 % 50 V 0805
C008	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C009	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C010	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C011	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C012	2310336	Ceramic cap.	18 p	5 % 50 V 0805
C013	2310512	Ceramic cap.	560 p	5 % 50 V 0805
C014	2310512	Ceramic cap.	560 p	5 % 50 V 0805

Layout Diagrams

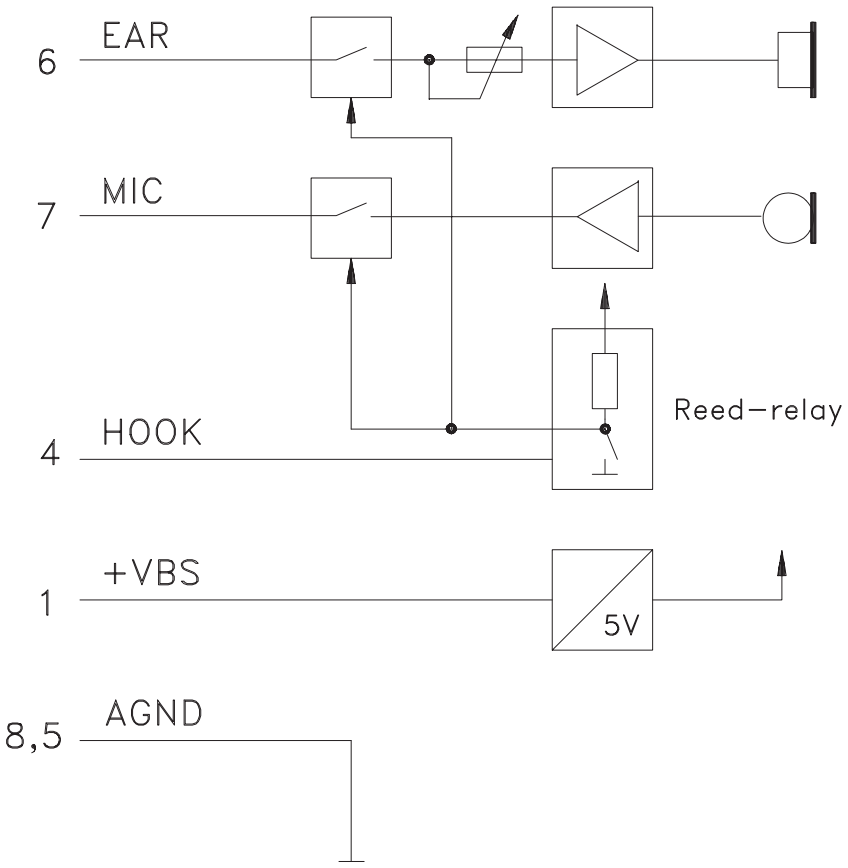
Circuit Diagram version 6.0



Voltage Regulator

Supply voltage to DG–1 module is fed via connector X1 pin 1. Voltage is regulated with regulator N1 (LP2951 ACM). Capacitors C4 and C1 are used to improve filtering. Bias voltage for Mic and Ear signals and amplifiers is made byamplifier N2C (TL074ID). Regulated voltage 5 volts is devided by resistors R1 and R2 and the amplified by N2C. Capacitor C18 filters regulated voltage.

Block Diagram



– HOOK switch (REED relay)

– Voltage regulator

Earphone and microphone paths are controlled by Hook switch, which is opened automatically, when the handset is lifted from the cradle. In the cradle there is a magnet and in the handset there is a reed relay. Reed relay controls audio switches. The earphone amplifier is differential type and output is symmetrical. Volume is user controllable. Microphone is an electret microphone (condensator type) with field effect transistor. It requires a bias voltage above 2.0 Volts for normal operation. Bias voltage is generated with suitable deviding resistors and transistor from regulated 8.5 V.

Earphone Amplifier

Earphone amplifier is of differential type. N2A and N2B are used to form a differential amplifier with total amplification of 26 dB. Ear signal is fed to DG–1 module via connector X1 pin 8. L2 and C3 are used to improve EMI characteristics. Capacitor C5 blocks DC of the signal analog switch N3A (74HC4066) switches Ear signal during ON HOOK state. Capacitor C24 is used to modificate frequency characteristics of Ear signal at higher frequencies. The gain of ear piece amplifier is set by resistors R14, R15, R16 and R17, R18. R19 is used to form side tone. Ear piece capsule is connected to the PC–board via connector X2. Resistors R20, R23, R26 and trimmer R22 attenuates Ear signal. Attenuation is about 20 dB when the trimmer is at minimum position.

Microphone Amplifier

Transistor V1 supplies bias voltage to Microphone. Bias voltage is filtered by C20, C11,C12, C14 and resistors R12, R13. Bias voltage is fed to microphone connector X3 via resistor R11. Bias voltage at connector X3 pin 1 is about 3.4 volt. Capacitor C10 blocks DC voltage of the Mic signal. Mic signal is amplified by N2D (TL074ID) Resistors R5, R7, R8, R9, R10 and capacitor C7, C9, C15 are used to filter Mic signal. Capacitor C8, C16, C23 are used to improve EMI characteristics. Gain of Mic amplifier is set by R7 and R24. Mic signal is fed to Ear amplifier via resistor R19 to form side tone signal. Mic signal is fed to connector X1 pin 7 via analog switch N3B (74HC4066). Capacitor C19 blocks DC voltage of the signal.

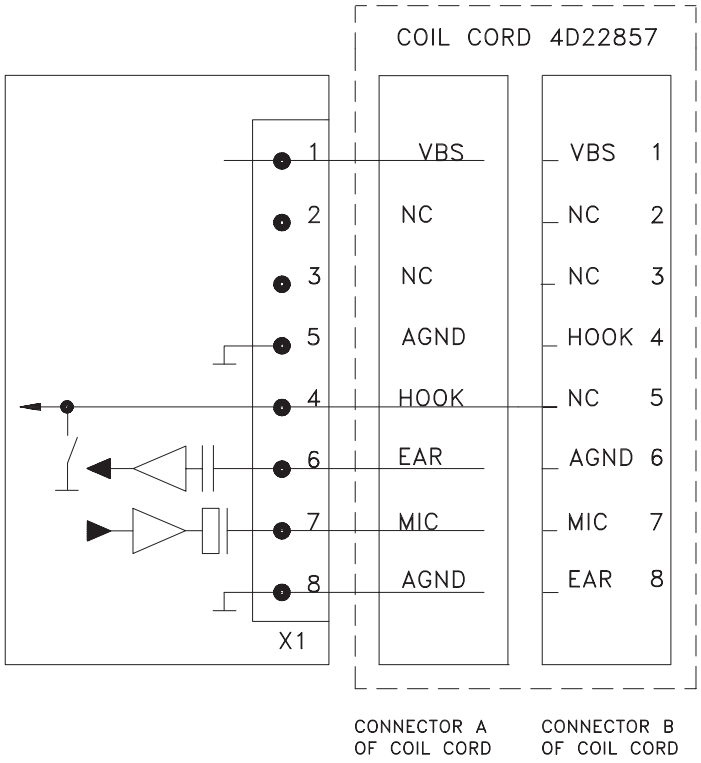
HOOK Operation

Both Mic signal and Ear signal are controlled by analog switches 74HC4066. Audio channels are open when Reed relay S1 is not activated. S1 is connected to Enable inputs of analog switches and R5 is a pull– up resistor to open analog switches when S1 is open. When S1 is activated (is closed) analog switches are opened. Resistor R21 and capacitor C21 forms a filter to improve EMI characteristics.

External Signals and Connections

The HSU–1 Audio Handset has an 8 pin modular connector at the end of the coil cord to the junction box. There are only five lines in use in the coil cord.

External Connections



Functional Description

Main function of The HSU–1 Audio Handset is to form an electroacoustic interface between the user and the phone environment. The HSU–1 Audio Handset consists of handset with coil cord and of cradle. In the handset there is earphone and microphone with corresponding amplifiers.There is also a simply interface for controlling these functions. Electronics consist of DG1 handset module. Mechanical dimensions are small and mechanics consists of A–cover, B–cover and coil cord with the cradle. The HSU–1 Audio Handset has a volume potentiometer.

Circuit Description

HSU–1 Audio Handset consists of the following functional blocks:

– Earphone amplifier

– Microphone amplifier

Technical Specifications

Modes of Operation

DG–1 module has only one mode of operation. Audio paths will become active when the handset is lifted from the cradle. Otherwise muting is on.

Maximum Ratings

–supply voltage:	16.0 V
–operation temperature range, specification:	– 25 —— + 55 C
–operation temperature range, operational:	– 25 —— + 85 C
–storage temperature range:	– 40 —— + 85 C

DC Characteristics

Symbol	Parameter	Minimum	Typical/ Nominal	Maximum
VBS	Supply voltage for electronics	9.0 V	13.2 V	16.0 V
Ihs	Handset current consumption	6.0 mA	8.0 mA	12.0 mA
Vaudio	Regulated audio voltage	7.7 V	8.3 V	8.7 V
Iaudio	Audio current consumption	6.0 mA	8.0 mA	12.0 mA

AC Characteristics

Microphone Side

Microphone amplifier gain for nominal signal is approx. 30 dB. Max output level is 1 Vrms. Idle noise of microphone amplifier should be less than –64 dBmOp (220 uV). Output impedance is < 300 ohms.

Earphone Side

Earphone amplifier input level is max. 503 mVrms. Acoustic idle noise of earphone is under –60 dBPa. Input impedance of earphone amplifier is > 10 kohm.

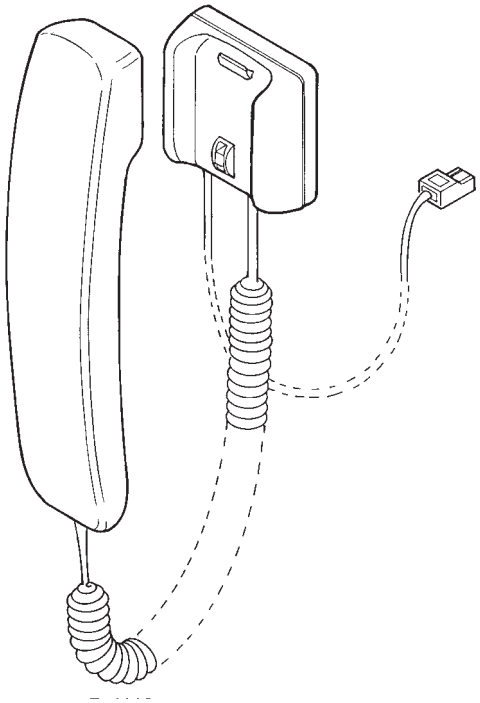
Sidetone

To be defined later.

Handset HSU–1

Introduction

Main function of the HSU–1 Audio Handset is to form an electroacoustic interface between the user and the phone environment.



Technical Summary

The HSU–1 Audio Handset consists of handset with coil cord and of cradle. In the handset there is earphone and microphone with corresponding amplifiers. There is also a simply interface for controlling these functions. Electronics consist of DG–1 handset module. Mechanical dimensions are small and mechanics consists of A–cover, B– cover and coil cord with the cradle. The HSU–1 Audio Handset has a volume potentiometer.

Use of Handset

The HSU–1 Audio Handset is designed to be a dummy handset with no display and no keyboard. Its use is to form an electroacouistical connection between the user and DCT – environment. When not in use the handset is on the cradle. During the use the handset is lifted from the cradle and audio paths are opened.

CONTENTS

Handset HSU–1 . . . . . – 3
Introduction . . . . . – 3
Technical Summary . . . . . – 3
Use of Handset . . . . . – 3
Technical Specifications . . . . . – 4
Modes of Operation . . . . . – 4
Maximum Ratings . . . . . – 4
DC Characteristics . . . . . – 4
AC Characteristics . . . . . – 4
Microphone Side . . . . . – 4
Earphone Side . . . . . – 4
Sidetone . . . . . – 4
External Signals and Connections . . . . . – 5
External Connections . . . . . – 5
Functional Description . . . . . – 5
Circuit Description . . . . . – 5
Earphone Amplifier . . . . . – 6
Microphone Amplifier . . . . . – 6
HOOK Operation . . . . . – 6
Voltage Regulator . . . . . – 7
Block Diagram . . . . . – 7
Circuit Diagram version 6.0 . . . . . – 8
Layout Diagrams . . . . . – 9
Parts List of DG1 (Version 1.1) Code 0200221 . . . . . – 10
Exploded view . . . . . – 12
Assembly parts . . . . . – 12

After Sales Technical Documentation

Handset HSU–1

Original 50/96

NMP Part No. 0275276